PSYCHOLOGICAL LITERATURE.

I.—NERVOUS SYSTEM.

Experimentelle und pathologisch-anatomische Untersuchungen über die optischen Centren und Bahnen. (Neue Folge). DR. C. v. MONAKOW. Arch. f. Psychiatrie, Bd. XX, Heft 3.

This paper is based on the detailed study of some five brains, three of them from dogs, from which the visual areas had been removed by Munk. These dogs were observed by Munk subsequent to the operation for considerable periods of time and when killed the brains were turned over to v. Monakow for histological examination —an example of that sort of co-operation in scientific investigation which will assuredly yield good results. The principal discussion relates to the true limits of the cortical visual areas (in dogs), the path connecting this region with the primary optic centres in the corpora geniculata externa, pulvinar and anterior corpora bigemina, and the nature of the connections in these centres on the one hand with the cortex and on the other with the retina. (In considering the latter points the results obtained from dogs, cats and rabbits are combined). In the dogs' brains the cortex for some millimeters cephalad of the visual area, as mapped by Munk, had degenerated, whereas the other portions of the surrounding cortex remained normal up to the edge of the cut. This difference in behavior is regarded as due to the fact that in the operation the coronal fibers for this anterior portion are almost of necessity injured and injury to these would cause the condition observed. In one case also the gyrus fornicatus was found to have a portion of the corpora geniculata externa dependent on it. This observation needs confirmation. At present v. Monakow contents himself with suggesting that the true limits of the visual area should be extended 4 or 5 mm. cephalad, of those given by Munk, especially along the mesial boundary. The fibers connecting the visual cortex with the primary optic centres run in the posterior portion of the internal capsule. When the cortex is removed by the knife there still remains a not inconsiderable portion of the gray matter in the depths of the sulci. As there was every reason to consider this as a part of the visual cortex and as at the same time it did not appear to be functional in operated dogs, Munk has assumed that it has degenerated as a consequence of the injury. v. Monakow however finds it in fairly good condition in several cases and hence some other explanation is needed for its inactivity.

Following the removal of the visual area changes take place in all three primary centres. In dogs and cats, the degeneration is found in the entire ventral and the cephalic portion of the dorsal nucleus of the corpora geniculata externa; in the caudal and ventral portions of the pulvinar and in the superficial gray and middle fiber layer of the anterior corpora bigemina. (By way of explanation it should be understood that v. Monakow distinguishes five cell groups

in the corpora geniculata externa. They form a dorsal group of two lying above a ventral group of two, which in turn is above the single ventral nucleus. The retina is specially connected with the caudal-dorsal nucleus while the other four are connected with the cortex. They are the frontal-dorsal caudal-ventral, frontal-ventral, and the ventral nuclei). In newborn dogs and cats the atrophy passes beyond the primary centres and involves the optic tracts, the optic nerves and the cells of the granule layers of the retina. In rabbits there is atrophy of the entire dorsal with slight atrophy of the ventral nucleus of the corpora geniculata externa, while the external fibre layer remains intact; atrophy of the ganglion cells and ground substance of the pulvinar and, in the anterior corpora bigemina of the middle fiber layer.

Section of the visual fibers in the internal capsule gives peripherally the same result as the removal of the visual area. At the same time there is an ascending degeneration which involves the large cells of the third layer of the cortex and the nerve networks in the region of the third and fifth layers.

Enucleation of the bulbi oculorum, in newborn animals is followed, in dogs, by atrophy in the gelatinous substance of the lateral zone of the corpora geniculata externa, together with that of the ganglion cells, especially in the dorsal-caudal nucleus of this body, also in the dorsal-caudal portion of the pulvinar. In the dog the disturbances in the anterior corpora bigemina are doubtful. The changes in the cat are similar to those in the dog save that the disturbance in the anterior corpora bigemina are more evident. In the rabbit finally the gelatinous substance of the lateral zone of the corpora geniculata externa atrophies, the cells of this body remaining fairly normal. The pulvinar shows no changes (?) but in the anterior corpora bigemina there is atrophy of the superficial layer of fibers with disappearance of the cells from the superficial gray layer. After removal of one of the anterior corpora bigemina, in the cat or rabbit, the tractus opticus becomes smaller and in the optic nerve the finer fibers degenerate, while the coarser ones remain intact (v. Gudden and v. Monakow). In newborn cats, in which an entire hemisphere has been removed and also the tractus opticus of the same side cut, a group of cells in the caudal-dorsal region of the corpora geniculata externa remains, while all other groups, together with those of the pulvinar, disappear (v. Monakow). After section of one optic tract in a rabbit there is atrophy in both nervi optici (insignificant, of course, in that of the same side), and in the corresponding portion of the retinae disappearance of the large ganglion cells of the deep layer. (Ganser).

These facts v. Monakow attempts to knit together so as to present in a scheme something of the relation of cells and fibers along the entire line of the optic pathway. In doing this he considers it as proved that, in newborn animals at least, section of systems of fibers causes them to degenerate in both directions, that after such a section certain groups of ganglion cells are fully destroyed while others are only slightly affected. He also accepts the two categories of cells according to Golgi, but agrees with Forel in considering those, the axis cylinder of which soon loses its identity and forms a network, as central or intermediate cells, serving to put into connection those of the first category. Physiological connection between the branches of a net is considered as due rather to the contiguity than the continuity of the finest branches. The cell groups that do

not degenerate on the section of the fibers are identified as intermediate cells (second category). Not to go into the details of the scheme we give his general statement of the result. "In each optic centre one system of fibers arises and one ends and the several systems of projection fibers are united with one another by intermediate cells. Both in the primary and in the secondary portions of the optic pathway two fiber systems run parallel and in opposite directions and groups of principal cells regularly alternate with intermediate ones." Or putting the facts in another way: in the centripetal direction we have (in the rabbit), the large ganglion cells of the retina, their axis cylinder processes passing in the optic nerve and terminating in a net-work in the lateral zone of the corpora geniculata externa. Here they make indirect connection with the intermediate cells which in turn are connected with the principal cells of this body and of the pulvinar. From these latter points fibers run to the fifth (and third) layer of the cortex in the visual area, there forming a network that connects with the cells forming the above mentioned layers and these in turn connecting with other elements (solitary cells) of the cortex. In the centrifugal direction we have the large pyramid cells of the third cortical layer, their axis cylinder prolongations passing ventrad as the fibers of the visual area and forming a network in the corpora geniculata externa (where?) and in the anterior corpora bigemina and through the intermediate cells in the latter, making connection with the principal cells in the superficial gray layer. The axis cylinder prolongations of these last give origin to the fine optic fibers which form a network in the retina and connect there with the granule layers.

This scheme is put forward by the author as tentative, but he expresses the hope that in the main it may be found correct. The idea of double tracts throughout the optic pathway is certainly striking, but in view of the problematical nature of the retina and optic nerve from a morphological standpoint, certainly worth further study. It must be remembered that as presented the scheme applies strictly to rabbits only.

On his way to these conclusions v. Monakow makes a number of interesting observations some of which may be briefly referred to. Goltz has pointed out that the dog without eyes differs much from the dog without visual centres, the latter exhibiting a marked disinclination or inability to go up and down steps or jump from a height, acts which the dog merely without eyes does with ease. A dog without eyes, which v. Monakow observed, and about whose general condition of health there could be no doubt, learned to go up and down stairs only with much difficulty and could not be persuaded to jump from a low bench. This same dog followed the movements of the children who kept him with such ease, was so active in play and in so many ways masked his defect of vision that v. Monakow refers to the case of the rabbit which had lost its visual centres on both sides and yet acted quite as if it could see (v. Gudden), remarking that the tests were such that, if applied to the blind dog just mentioned, they would prove that he too could see. This criticism is however not conclusive. There seems little doubt that certain birds can see without the aid of the cerebral hemispheres and among the cold blooded vertebrates the primary optic centres appear quite independent. It is still a fair field for investigation to determine whether among the mammalia such independence can exist.

On the anatomical side v. Monakow notes that in the vertebrate

series as we descend, the anterior corpora bigemina or their homologues, the optic lobes, become more and more important as optic centres until they are finally the exclusive centres for vision. As regards the history of the degenerative process v. Monakow finds that in the pulvinar and the anterior corpora bigemina the degenerative process after removal of the visual area first attacks the ganglion cells and only secondarily and later is the ground substance involved. Further, that the stellate cells are comparatively early productions in the process, being absorbed in the later stages.

A continuation of the paper is promised.

Makroscopische pathologisch-anatomische Hirnpräparate. DR. C. v. MONAKOW. XIV Wanderversammlung südwestdeutscher Neurologen und Irrenärzte, Mai, 1889. Abstract in Neurolog. Centralbl, No. 13, 1889, by Dr. L. Laquer.

v. Monakow exhibited the following preparations:

1. Brain of dog from which on the day of birth there were removed the entire occipital and a portion of the temporal lobes on the left side. Death after eight weeks, corpora geniculata externa, pulvinar and corpora geniculata interna on the left side much atrophied. Left optic tract up to chiasma considerably reduced in volume. Both nervi optici slender.

2. Brain of a dog from which the larger part of the right cerebral hemisphere was removed three days after birth. Besides the frontal end and the olfactory lobe only fragments of the gyrus fornicatus and sigmoideus and of the temporal lobes remained behind. The internal capsule was completely severed. Death after 8½ months. There was found great shrinkage of the thalamus opticus, corpora geniculata externa and corpora geniculata interna on the right side; evident flattening of the right anterior colliculus of the corpora quadrigemina and the right corpus mammillare. Right pyramid had completely disappeared and the pons on the right side was flattened. Right optic tract as far as the chiasma reduced to half the size of the left one. Both nervi optici small but not macroscopically very different from one another. The region of the nuclei of the columns of Goll and Burdach slightly depressed on the left side; corpus callosum very thin. The cerebellar hemispheres quite normal and similar but the hemisphere on the right side had expanded somewhat into the cavity left by the removal of the occipital lobe on that side.

3. Human brain extensive region of softening in the left occipital lobe. Patient a painter, 68 years of age, who suffered from hemianopsia and alexia. The medullary substance in the region of the angularis, the first occipital convolution and the caudal-dorsal portion of the præcuneus for the most part destroyed and absorbed, giving rise to an extensive cyste. The softening nowhere reached the sagittal fibers. Posterior cornu much distended, cuneus and the second and the third occipital convolutions intact. The same was true for the ventral portion of the bundle of Gratiolet. The cortex of the gyrus angularis appeared quite normal. Secondary degenerations were observable in the dorsal portion of the bundle of Gratiolet on the left side as far as the lateral fiber layer of the pulvinar. Considerable secondary reduction in the pulvinar and corpora geniculata externa on the left side. Atrophy of the arm of the anterior colliculus and of the caudal portion of the left tractus opticus.